APPLICATION FOR UNITED STATES PATENT

ALL PARAFFINIC, LOW TEMPERATURE HYDRAULIC OILS

Applicants: Kyle D. Lawrence
Lisa A. Semmel

CROSS-REFERENCE TO RELATED APPLICATION:

This application claims the benefit of U.S. Provisional application 60/458,639 filed March 28, 2003.

"EXPRESS MAIL" mailing label number EU863100600US

Date of Deposit MARCH 17, 2004

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner for Patents, Washington, D.C. 20231.

KATHLEEN A. KUNA
(Typed or printed name of person mailing paper or fee)

(Signature of person mailing paper or fee)

CASE NO. MDM-0401

27810
PATENT TRADEMARK OFFICE

ALL PARAFFINIC, LOW TEMPERATURE HYDRAULIC OILS

[0001] This application claims the benefit of U.S. Provisional application 60/458,639 filed March 28, 2003.

Field of the Invention

[0002] The present invention relates to hydraulic oils. More particularly the present invention relates to low temperature, multi grade, hydraulic oils.

Background of the Invention

[0003] Hydraulic fluids are used in a wide variety of applications. For example, hydraulic fluids are used in vehicle transmissions, differentials, brakes and the like and in non-vehicular equipment and machinery used for example in injection molding and general manufacturing.

[0004] Hydraulic fluids are commercially available in different viscosity grades in order to meet equipment manufacture requirements. Many of these standard hydraulic fluids have difficulty, however, in meeting all of the viscometric properties required for the advanced designs of equipment now being developed and put into use. For example, in order to formulate low temperature, multi-grade hydraulic oils it has been necessary to use naphthenic base stocks or severely hydrotreated basestocks. Each of these approaches has disadvantages.

[0005] One disadvantage in using naphthenic basestocks is cost. Naphthenic basestocks are relatively more expensive than similar viscosity paraffinic basestocks. Another disadvantage is availability. There are fewer producers of naphthenic basestocks than paraffinic basestocks.

[0006] As with naphthenic basestocks, severely hydrotreated basestocks are more expensive than similar viscosity paraffinic basestocks for substantially the same reasons. Basically fewer refineries produce severely hydrotreated basestocks compared to paraffinic basestocks.

[0007] It would be desirable therefore to be able to have a low temperature, multi-grade hydraulic oil that did not require the use of a naphthenic basestock or a severely hydrotreated basestock.

Summary of Invention

[0008] Broadly stated the present invention comprises a multi-grade hydraulic oil comprising:

(a) 5 wt% to 90 wt% of a first paraffinic oil having a kinematic viscosity at 100°C of between 2 to 6 cSt;

(b) 5 wt% to 90 wt% of a second paraffinic oil having a kinematic viscosity at 100°C of between 3 to 14 cSt; and

(c) 5 wt% to 10 wt% of a polymethacrylate viscosity index improver having a shear stability index in the range of 0 to 20, wherein the composition has a shear loss of less than 7% after 40 minutes as measured by ASTM D5621 and wherein for any given viscosity grade the composition has at least substantially the same or better Brookfield viscosity at 0°F and -20°F as a naphthenic oil containing hydraulic fluid of the same viscosity grade.

Detailed Description of the Invention

[0009] The composition of the present invention include two Group I paraffinic oils. Group I paraffin oils typically have viscosity indicies in the range of about 80 to 120, contain < 90% saturates and > 0.03% sulfur.

[0010] The first Group I paraffinic oil of the present invention is one having a viscosity of 2 to 6 cSt at 100°C and a viscosity index (VI) of 85 to 95. Also, the first Group I paraffinic oil will comprise from 5 wt% to 90 wt%, based on the total weight of the composition.

[0011] The second Group I paraffinic oil is one having a viscosity of 3 to 15 cSt at 100°C and a VI of 90 to 95. The second Group I oil will be present in the composition in an amount in the range of 5 wt% to 90 wt% based on the total weight of the composition.

[0012] The hydraulic oil also contains a poly methacrylate viscosity index improver (VII) having a shear stability index in the range of 0 to 20, and preferably 10 to 20. Typically suitable polymethacrylate VII's will have average molecular weights in the range of about 10,000 to 1,000,000, and more typically between about 20,000 to about 500,000. The amount of this VII component is from 5 wt% to 10 wt%, preferably from 6 wt% to 7.5 wt% based on the weight of the composition.

[0013] The foregoing components must be carefully selected and their relative amounts balanced to obtain compositions that will have a shear loss of less than 7% after 40 minutes for any given viscosity grade having at least substantially the same low temperature properties as a naphthenic oil containing hydraulic fluid composition of the same viscosity grade. For hydraulic oils of viscosity grades 15 to 150 the compositions preferably have the properties shown in Table 1.

TABLE 1

Property	ASTM Test Method	Units	ISO 15	ISO 22	ISO 32	ISO 46	ISO 68	ISO 100	ISO 150
Maximum KV @ 40°C	D445	cSt	15.50	23.90	32.30	47.00	71.40	105.00	150.00
Pour point	D97	°C	-42	-42	-42	-39	-39	-39	-30
Brookfield Viscosity, 0°F	D2983	CP	500	1000	1300	2600	6000	12000	22,500
Brookfield Viscosity, -20°F	D2983	CP	1000	2500	5000	12000	30,000	80,000	N.A.
Maximum Shear Loss	D5621	%	7	7	7	7	7	7	7

N.A. = Not Applicable

[0014] In addition to the foregoing components the hydraulic oil composition will typically include a minor amount of a conventional additive typically used in hydraulic oils such as pour point depressants, anti-oxidants, anti-foam agents and the like.

Examples

[0015] The invention will be illustrated by the following examples which include preferred embodiments thereof. For the examples the following components were used to prepare hydraulic fluids of the specified ISO viscosity grade:

I A Group I paraffinic oil having a viscosity of about 2.6 cSt at 100°C and a VI of 85.

II A Group I paraffinic oil having a viscosity of about 4 cSt at 100°C and a VI of 95.

III A Group I paraffinic oil having a viscosity of about 5.4 cSt at 100°C and a VI of 95.

IV A Group I paraffinic oil having a viscosity of about 7 and a VI of 95.

V A Group I paraffinic oil having a viscosity of about 14 cSt at 100°C and a VI of 90.

VI A poly methacrylate VII having a shear stability index of about 14 and sold by RohMax under the trade name Viscoplex 8-219.

VII A commercial additive package containing a pour point depressant and components such as an antiwear additive, corrosion inhibitor, antioxidant and defoamant. These various components were used in the amounts shown in Table 2 and the properties thereof are also given.

TABLE 2

Examples	1	2	3	4	5	6	7
ISO Grade Components, wt%	15	22	32	46	68	100	150
I	86.34	50.10	31.73	7.79			
II	4.71						
III		41.55	58.22	82.25	64.25	38.21	19.34
IV							
V					26.68	52.04	70.12
VI	6.20	5.60	7.30	7.21	6.32	7.00	7.79
VII	2.75	2.75	2.75	2.75	2.75	2.75	2.75
KV@ 40°C	14.16	22.90	31.06	45.52	70.60	99.76	146.40
Pour point, °C	-54°C	-51°C	-48°C	-45°C	-48°C	-45°C	-30°C
Brookfield viscosity, 0°F	210cP	580cP	1060cP	2140cP	5040cP	9180cP	18040cP
Brookfield viscosity, -20°F	860cP	2120cP	4160cP	9240cP	26100cP	59900cP	N.A.
Shear loss	4.8%	5.0%	6.0%	6.0%	4.8%	4.8%	5.9%

N.A. = Not Applicable

For comparative purposes three ISO 32 multi-grade hydraulic oils were prepared and their properties determined. The compositions and results are given in Table 3 which also includes properties for a commercial, naphthenic containing, hydraulic oil. As can be seen while Blend 1 had a shear loss less than 7% it did not have low temperature properties. Blend 2 failed on shear loss and pour point and blend 3 failed the Brookfield - 20°F viscosity and pour point.

TABLE 3

Comparative Examples	1	2	3	4
Component, wt%	Blend 1	Blend 2	Blend 3	Commercial Oil
I		52.3	45.90	
II	78.00			
III		37.60		
IV	15.90		48.00	
V				
VI	6.00	10.00	6.00	
VII	0.10	0.10	0.10	
KV @40°C	31.10	31.26	29.34	
Pour Point, °C	-39°C	-45°C	-48°C	-51°C
Brookfield viscosity, at 0°F	1190 cP	670 cP	1120 cP	1370 cP
Brookfield viscosity, at -20°F	8660 cP	2470 cP	5610 cP	5110 cP
Shear loss	5.7%	13.7%	N/A	4.5%